

Appl. No.09/942,628  
Amdt. dated June 21, 2005  
Reply to Office action of March 22, 2005  
Atty. Docket No. AP1102US

**Amendments to the Drawings:**

The replacement sheets of drawings include changes to Figures 4, 6 and 7. These sheets, which include Figures 4, 5, 6, 7 and 8, replace the original sheets which included Figures 4, 5, 6, 7 and 8. In amended Figure 4, the three occurrences of "FFT" have been changed to "IFFT". In amended Figure 6, the three occurrences of "IFFT" have been changed to "FFT".

Attachment: Replacement Sheets (2)  
Annotated Sheets (2) Showing Changes

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### REMARKS/ARGUMENTS

The amendments to the specification correct a number of errors which are self-explanatory. In addition, the amendments to the SUMMARY OF INVENTION align the statements of invention with the amended independent claims.

The amendments to the drawings correct the labelling of the FFT and IFFT units which had been transposed in original Figures 4 and 7.

In the claims, original claims 1 and 4 to 9 have been cancelled and original claims 2, 3 and 10 to 16 have been amended. New claims 17 to 37 have been added. New claims 17, 18, 19, and 30 correspond to original claims 1, 4, 5, and 9, respectively. Other new claims were introduced so as to form a set of three "apparatus" claims for (i) system comprising a transmitter and a receiver; (ii) the transmitter *per se*; (iii) the receiver *per se* and a corresponding set of three method claims. This claim grouping was introduced so as to avoid stating, as in original claims 7 and 8, that the system is inside the receiver. It is submitted that there is adequate support for such claims in the specification as filed.

Claims 15 and 16 and the supporting paragraph beginning at page 4, line 3 have been amended to clarify that the bandwidth varies (differs) from one subband to another with a corresponding variation in FFT size and upsampling or downsampling rate, thus avoiding the implication that the bandwidth, FFT size and sampling rate for a particular subband are variable. No new subject matter has been added since this should have been obvious to a person skilled in the art.

In the Office Action, original claims 1 and 9 were rejected as anticipated by each of US5,528,581 (De Bot) and US5,867,479 (Butash). The foregoing amendments cancelled claims 1 and 9 and replaced them by new claims 1 and 16, each of which specifies that the system comprises a transmitter and a receiver each of which uses a different FFT for each sub-band signal. Thus, according to new claims 1 and 9, the transmitter divides the bandwidth into sub-bands each for a corresponding sub-band signal; performs Inverse Fast Fourier Transform (IFFT) upon the sub-band signals using, for each sub-band signal, a respective one of a plurality of different FFTs, and transmits the transformed sub-band signals to the receiver.

The receiver receives the transformed sub-band signals and performs forward Fast Fourier Transform upon them using, for each transformed sub-band signal, a respective one of a plurality of different FFTs corresponding to those used in the transmitter.

An important advantage of using a different FFT for each sub-band signal is that each FFT/IFFT can have a different size and different up-/down-sampling rates and be used, which means that it is not necessary to use the same M for different branches. This allows the size or order of the FFT for a particular sub-band or channel to be selected according to the channel requirements, which allows the implementation to be simplified, particularly where the signal spectrum used is limited to only a few spectrum regions, such as in DMT transmission systems.

US5,528,581 neither discloses nor suggests such a transmitter and receiver. Rather, U.S. 5,528,581 discloses a receiver implementation with application in signal analysis in which antennas 20 to 24 are different receivers that receive the same signal. Filters 34 to 38 are identical filters. The COMB. 40 to 44 combine the same signal information received from different receivers 20-24 for further analysis. There is no disclosure of the use of IFFT/FFT for signal decomposition and reconstruction.

US5,867,479 discloses a Multiplex/Demultiplex arrangement suitable for FDM communications. As can be seen from Figures 9 and 11, it uses a single FFT/IFFT. It neither discloses nor suggests the use of different FFT/IFFTs for the different sub-band signals.

Accordingly, new claims 1 and 16 are patentable over US5,528,581 and US5,867,479.

In the Office Action, original claims 1 to 10 and 13-16 were rejected an anticipated by

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US6,442,195 (Liu *et al.*). US6,442,195 discloses an analog front end circuit comprising a group of analog sub-band filters 280A, 280B and 280C whose analog sub-band signals are converted by analog-to-digital converters 280A', 280B' and 280C', respectively. The separation into sub-band signals in different bands is to reduce the burden on ADC. The reference to "FFT (not shown) in the DMT Rx Core" can only be taken to be a reference to known FFT implementations in conventional DMT receivers which use the same FFT for all channels. Thus, US6,442,195 neither discloses nor suggests the features of new claims 1 and 16 and claims dependent upon one or other of them, which require the use of a different FFT for each sub-band signal.


Original claims 11 and 12 were rejected under 35 U.S.C. 103(a) as unpatentable over US6,442,195 (Liu) in view of US6,456,657 (Yeap). Claims 11 and 12 were dependent upon independent method claim 9 and further specified the use of single side band filters. In view of the reasons given above as to why Liu is not applicable to new independent method claim 16, it follows that the combination does not render claims 11 and 12 obvious. Moreover, US6,456,657 uses a special kind of transformation process called Discrete Wavelet Transformation (DWT) which uses special analysis and synthesis filter banks. It is a completely different approach to channel separation and is intended to replace current DMT systems, which use FFT for channel separation. Accordingly, a skilled person would not be led to combine the teachings of US6,456,657 with US6,442,195. It follows that the rejection of claims 11 and 12 as unpatentable over this combination of references is without merit.

In view of the foregoing, it is submitted that all claims of record are patentable over the cited references and early and favourable reconsideration of the application is respectfully requested.

Respectfully submitted,

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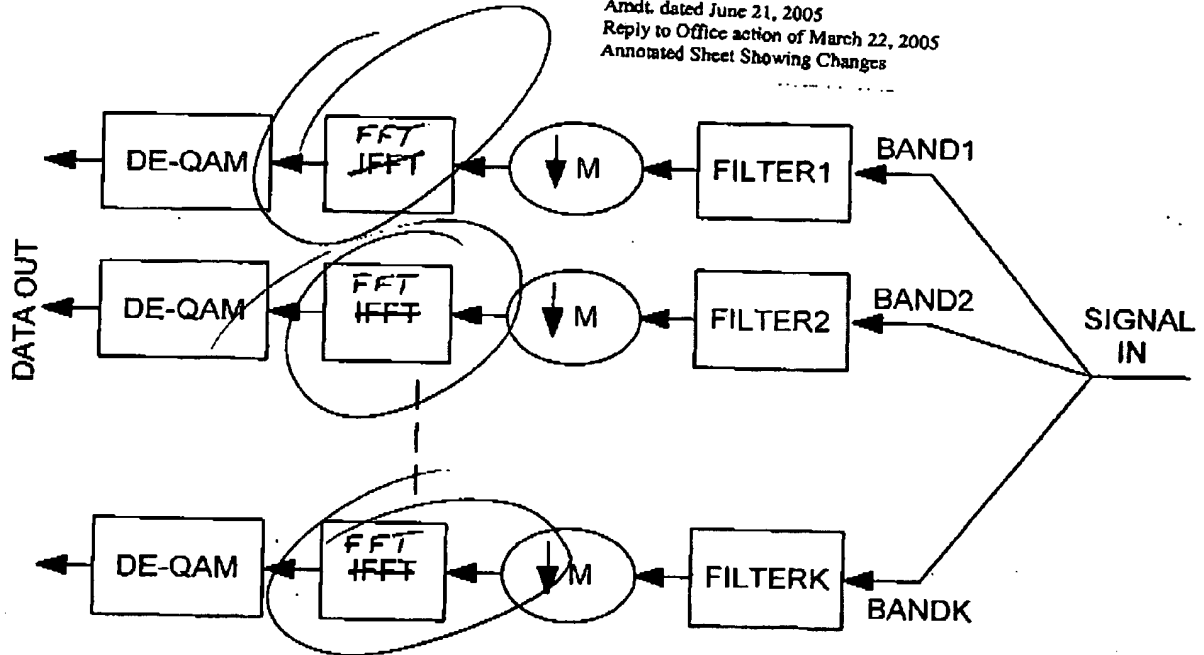
21<sup>st</sup> June 2005



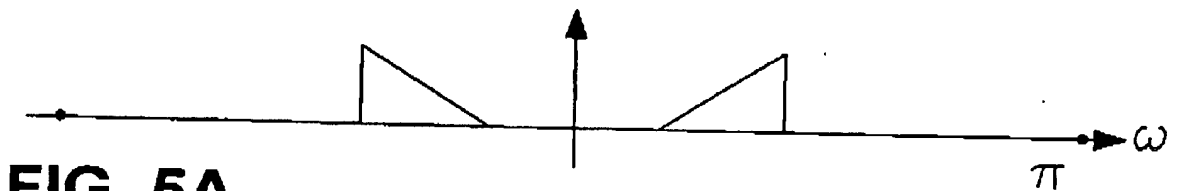
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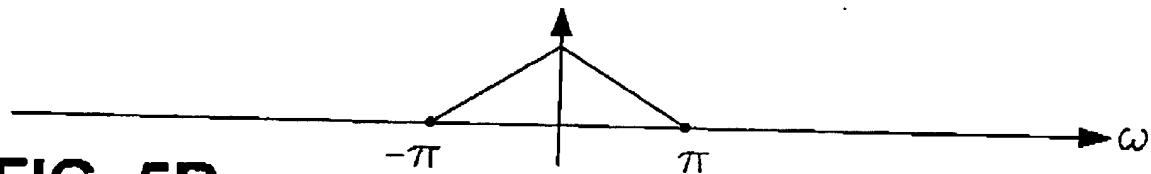
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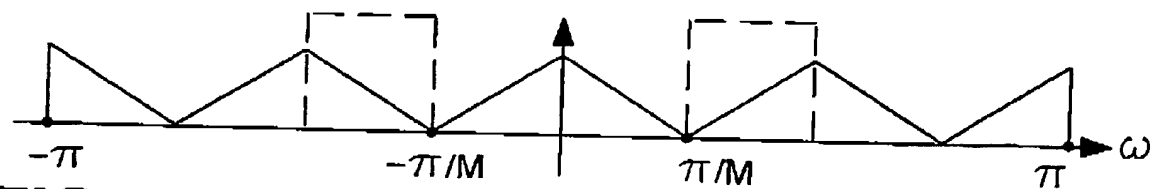
**FIG. 4**



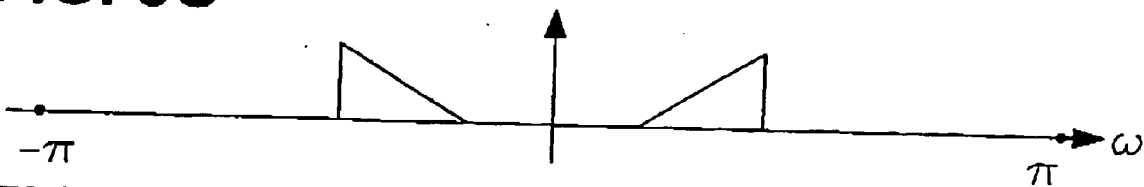
**FIG. 5A**



**FIG. 5B**



**FIG. 5C**



**FIG. 5D**

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